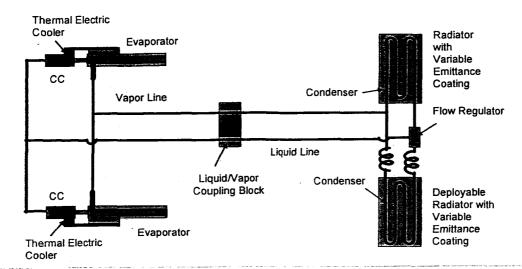
Subsystem: Thermal Management Subsystem for Small Spacecraft

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URLs for additional information:
http://mscweb.gsfc.nasa.gov/545web/Groups/P2/545p2.html

Miniature Loop Heat Pipe (MLHP) Thermal Management System



Technology Description:

The MLHP Thermal Management System consists of a loop heat pipe (LHP) with multiple evaporators and condensers, thermal electrical coolers, and deployable radiators coated with variable emittance coatings (VECs). All components are miniaturized. It retains all the performance characteristics of state-of-the-art LHPs and offers additional advantages to enhance the functionality, versatility, and reliability of the system, including flexible locations of instruments and radiators, a single interface temperature for multiple instruments, cooling the "on" instruments and warming the "off" instruments simultaneously, improving start-up success, maintaining a constant LHP operating temperature over a wide range of instrument powers, effecting automatic thermal switching and thermal diode actions, and reducing supplemental heater powers. It can fully achieve low mass, low power and compactness necessary for future small spacecraft.

Applicability:

Potential applications of the MLHP thermal technology for future missions include: 1) Magnetospheric Constellation; 2) Solar Sentinels; 3) Mars Science Laboratory; 4) Mars Scouts; 5) Mars Telecom Orbiter;

6) Space Interferometry Mission; 7) Laser Interferometer Space Antenna; 8) Jupiter Icy Moon Orbiter; 9) Terrestrial Planet Finder; 10) Single Aperture Far-Infrared Observatory, and 11) Exploration Missions.

Benefits to NASA Science Missions:

The MLHP Thermal Management System combines the operating features of a variable conductance heat pipe, a thermal switch, a thermal diode, and a state-of-the-art LHP into a single integrated thermal system. It offers many advantages over conventional thermal control techniques, and can be a technology enabler for future space missions. Successful flight validation will bring the benefits of MLHP technology to the small satellite arena and will have cross-cutting applications to both Space Science and Earth Science Enterprises.

Development Status and Plans for Flight Readiness		
Description	Technology Maturity	Date (to be) Completed
MLHP Breadboard	Ambient Testing (TRL 4)	4/2004
MLHP Breadboard with VECs	Thermal Vacuum Testing (TRL 5)	7/2005
MLHP Flight Unit Ground Tests	Thermal Vacuum Testing (TRL 6)	12/2006
MLHP Space Flight Experiment	Flight Validation (TRL 7)	1/2008
MLHP Analytical Models	Analytical Models Fully Validated	1/2008